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Optimizing oral health: Towards a tailored, effective and cost-effective dental care

Vermaire, J.H.

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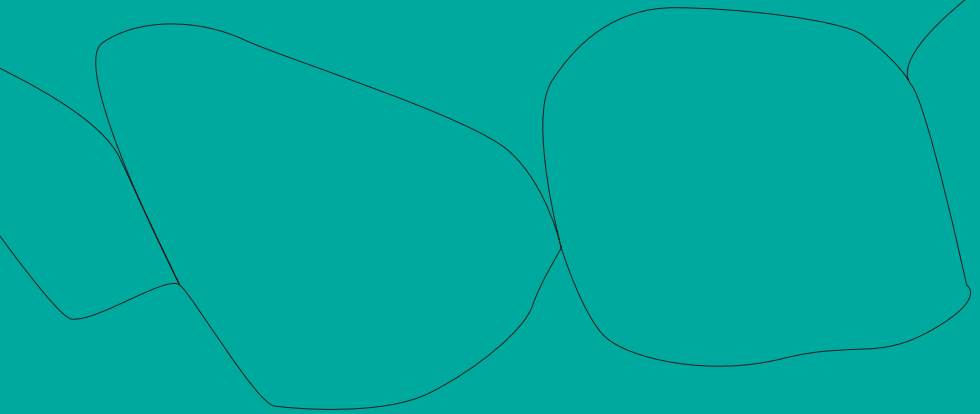
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Chapter

1

Introduction



Introduction

Background

The main topic of this thesis is the prevention of dental caries in children. Caries can be regarded as the outcome of a demineralization process that occurs when commensal oral microorganisms ferment dietary carbohydrates to acid causing a pH drop in the dental plaque with subsequent demineralization of the enamel and dentine (Keyes & Jordan, 1963). Caries has been found in human ancestors already. First signs of caries have been found in Australopithecines (living about 10^6 years ago) and in Neanderthals (living about 10^5 years ago). The first distinct increase in caries prevalence started in medieval age, not coincidentally in the same period that the introduction of sugar cane in human diet took place. Approximately 10 carious teeth per 100 teeth was estimated for the Middle Ages (500-1500 A.D.) (Keene, 1980; Varrela, 1991; Caffel et al., 2004; Esclassan et al., 2008). The second distinct increase in caries prevalence occurred in the first two decades after World War II (1945-1965) mainly due to the increased availability to (sugary) foods and drinks. Approximately 25 carious teeth per 100 teeth was reported in modern age (data 2003; website WHO). The first signs of invasive caries treatment known so far (drilled occlusal surfaces of permanent molars), have been reported to originate from the Neolithic age (7,500-9,000 years ago) in Pakistan (Coppa et al., 2006), while the first proof of caries preventive activities (the use of a toothbrush) have been reported to originate from ancient China 1,600 years ago (Kumar, 2011).

Nowadays, caries is found to be one of the most prevalent diseases among children worldwide: 60-90% of all schoolchildren experience one or more carious lesions in their primary teeth. Caries is present, albeit unequally distributed, throughout all socioeconomic classes in both developing and developed countries (Bagramian et al., 2009; Petersen, 2003). An unhealthy mouth can result in reduced general health. The relationship between oral health and general health is increasingly recognized (Söder et al., 2012; Soto-Barreras et al., 2012). While the basis for maintaining a good oral health is laid in childhood (Thorstensson & Johansson, 2009), it is desirable to start caries preventive actions as early in life as possible.

Caries preventive measures

According to current standards, caries is a disease that can be prevented. The most effective measure for caries prevention nowadays is considered to be the daily use of fluoridated toothpaste (Marinho et al., 2003). Despite the fact that brushing one's teeth with fluoridated toothpaste twice daily should not be too difficult to achieve, still the mean number of decayed, missing and filled surfaces as a result of caries (DMFS) in 17-year-old children in the Netherlands is 5.2 (\pm 7.6) (Poorterman & Schuller, 2006). Behavioural aspects are considered to play a role in caries prevention, as do the prevailing attitudes individuals may have concerning caries preventive measures.

In the Netherlands, a common caries prevention programme consists of dental check-ups routinely twice a year, frequently followed by a professional fluoride application and sealing all fissures of newly erupting permanent molars. Still, the percentages of 5-, 11-, 17- and 23-year-old children with no caries experience (dmfs/DMFS = 0) are respectively 44%, 53%, 29% and 14% (Poorterman & Schuller, 2006), certainly leave room for improvement.

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Exploring the possibilities to achieve this improvement in a regular dental practice resulted in two different approaches. The first one was to intensify the professionally administered prevention component of the regular approach: a meta-analysis of 14 placebo-controlled trials concluded that a higher caries preventive fraction was shown with increased frequency and intensity of professional fluoride applications (Marinho et al., 2002). In this thesis, this approach is referred to as the Increased Professional Fluoride Application (IPFA) regime. The second one was to reduce these professionally administered preventive interventions and to intensify the parental home care component of the regular approach: implementing such a non-operative caries treatment and prevention strategy has shown good results in Denmark and Russia (Carvalho et al., 1992, Ekstrand et al., 2000, Ekstrand & Christiansen 2005). However, the performance of this strategy has not been evaluated in the Netherlands yet. This approach will be referred to as the Non-Operative Caries Treatment and Prevention (NOCTP) regime in this thesis. Because of the different kinds of the suggested interventions, a randomized controlled clinical trial seemed the most accurate way to compare effectiveness of both strategies, with the normal strategy as control group.

Health economic aspects

In spite of increasing health care expenditures – and dentistry expenditures do not form no exception – health care budgets ultimately remain limited and, hence, choices need to be made about how to spend available resources optimally. In that context, health care decision makers may favour cost-effective interventions and prevention regimes. By spending available resources on the most cost-effective interventions, population's (oral) health can be optimized. Those interventions that offer sufficient value for money can then be selected and implemented. Optimal prevention of caries may be an important goal in that context, also given that in 2010 60% of the total dentistry budget (being 1.8 billion Euros) was spent on caries (Slobbe et al., 2011). Therefore, prevention of the disease may induce important health gains. In this thesis, it is investigated whether it is possible to attain such health gains against reasonable costs. In theory, prevention of caries might even induce cost reductions (when saving later costly interventions), but this need not be the case to be economically attractive. For the latter it is merely important that benefits outweigh the costs. In this thesis, this is investigated for the two intervention strategies compared to the current treatment strategy, performing an economic evaluation (Drummond, 2005).

Behavioural aspects

One of the tested measures in this trial (NOCTP) is considered to draw on parents' preparedness to be more involved in the –individually assessed– caries preventive care for their child. It would be of value to know in advance to what extent they indeed are willing to invest in their child's healthy mouth. Attitudes are likely to play a role in general health and oral health behaviour (Skeie et al., 2006; Jerkovic et al., 2009; Mohebbi et al., 2008; Poutanen et al. 2007). Therefore, the identification of prevailing attitudes in general and individually can be considered vital information in designing strategies to deliver individualized preventive care.

Aim of the thesis

The main aim of this thesis is threefold. Firstly, to test and describe a randomized clinical controlled trial testing the clinical performance of two different caries-prevention strategies compared with a regular approach (chapter 2). Secondly, to perform an economic evaluation of the applied strategies in this trial, thus investigating their 'value for money' (chapter 3). Thirdly, to explore parents' willingness to invest in oral health of their child, the prevailing parental attitudes towards prevention and attitude-dependent oral health behaviour (chapters 5, 6 and 7). These chapters are intermitted by a description of the sample of the children whose parents chose to participate in the RCT and the children whose parents chose not to do so (chapter 4). These studies jointly aim to test alternative possibilities for caries prevention in children in the Netherlands, explore the health economic aspects related to these measures and identify possible (implementation) pitfalls these measures could entail.